SCIENCE

VOL. 99 FRIDAY, JUNE 2, 1944 No. 2579

SCIENCE: A Weekly Journal devoted to the Advancement of Science. Editorial communications should be sent to the editors of SCIENCE, Lancaster, Pa. Published every Friday by

THE SCIENCE PRESS
Lancaster, Pennsylvania

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington 25, D. C.

HISTORY AND ACTIVITIES OF THE U.S.S.R. ACADEMY OF SCIENCES DURING THE PAST TWENTY-FIVE YEARS

By FREDERICK E. BRASCH

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THE Library of Congress has appropriately taken steps to recognize the heroic efforts of the Russian people, who are making a stand to safeguard their borders and their civilization. This effort is being made according to the most logical and modern concept of defense and progress, namely, through concerted scientific, technical and cultural development. The past twenty-five years has taken on the aspect of a new "Renaissance" of Russian culture.

At the Library of Congress there has been installed an exhibition portraying this new "Renaissance." The exhibition centers principally about the history and work of the U.S.S.R. Academy of Sciences. The Academia Imperiale des sciences de Saint-Pétersbourg, Imperatorskaya Akademiya naük, was projected in 1718 by Peter the Great in cooperation and with the advice of German scholars of that period, principally Gottfried Wilhelm Leibnitz and Baron Chretien Wolff. Peter died in 1725 and his widow, Catherine I, ordered the opening of the academy according to prepared plans. The first meeting was held on December 27, 1725, with Laurent Blumentrost (1692–1764) as the first president, and with a large and distinguished group of foreign scholars in attendance. Catherine furthered Peter's plan by appointing a faculty of mostly German-Swiss scholars to the university, which was at the same time the academy. Included in the large number of scholars appointed and associated with the academy were Jacques Hermann, 1678–1733, professor of mathematics from Switzerland; Chretien Goldbach, 1690–1764, professor of mathematics from Germany; Leonard Euler, 1707–1783, professor of mathematics from Switzerland; Nicolas Bernoulli, 1695–1726, professor of mathe-

matics from Switzerland; Daniel Bernoulli, 1700–1782, professor of mathematics from Germany . . . and many others. Under the guidance of this notable group of scientists, the first of a long series of publications entitled "Commentarii Academiae Imperialis Scientiarum Petropolitanae" was issued by the academy.

In 1747 the academy was officially divided into two sections—the academy proper and the university. The latter, however, for lack of students, ceased to function by 1754. The University of Moscow opened in 1755, and so great was the intellectual growth among the Russian people that other cities soon established universities.

During the short reign of Peter II, the academy was neglected by the Court and the stipends of its members were discontinued; but it was again patronized by Empress Anne, who added a seminar under the superintendency of the professors. Both institutions flourished for some time under the direction of Baron Johann Albrecht Korff (1697–1766). At the accession of Elizabeth, the original plan was enlarged and improved, and again foreign scholars were drawn to St. Petersburg (Leningrad). It was considered a good omen for the culture of Russia when two natives, M. V. Lomonosov (1711–1765) and S. I. Rumovskii (1732–1812), who were men of genius and had prosecuted their studies in foreign universities, were enrolled among its members. Further stimulation was provided by Catherine II, who utilized the academy for the advancement of national culture. By her recommendation the most able professors visited all the provinces of her vast dominion, with ample means for research and publication in the natural resources of the country. The result was that no country at that time could boast within so few years such a number of excellent official publications concerning the natural sciences, together with the geography and history and other cultural interests of the different provinces. All these publications were issued by the academy. The first transactions, "Commentarii Academiae Scientiarum Imperialis Petropolitanae ad annum 1726," with a dedication to Peter II, were published in 1728. This was continued until 1747, when the transactions were called "Novi Commentarii Academiae," etc.; and in 1777, "Acta Academiae Scientiarum Imperialis Petropolitanae," with some alteration in the arrangements and plan of the work. The papers, hitherto in Latin only, were now written indifferently in Latin or in French, and a preface added, "Partie Historique," which contains an account of the society's meetings. Of the Commentaries, fourteen volumes were published: of the "New Commentaries" (1750–1776) twenty. Of the "Acta Academiae" two volumes are printed every year. In 1872 there was published at St. Petersburg in two volumes, "Tableau général des matières contenues dans les publications de l'Académie Impériale des Sciences de St. Petersbourg."

This latter publication contains an excellent historical résumé of the academy's early work, membership and lists of the various transactions and proceedings published since the founding date.

The buildings of the academy were furnished with the latest apparatus and the finest selection of books for the library, together with a museum and lecture halls. Quoting Alexander Petrunkevitch, of Yale University:

> However, such was the status of scientific progress with the special group created by the Tsars in the early eighteenth century. During the nineteenth century, education for the people in general, especially in the field of science, was for a long period unpopular and was limited to a comparatively small group. Even during the early period of this century education had not yet penetrated into the larger masses. The purely clerical knowledge of the Tsarist Russia gave way to military training and to such education as was necessary for service in the bureaucratic institutions created by Peter the Great. Later, humanistic studies became the standard of good education and dominated Russian society and Russian thought until comparatively recently. Medicine, of course, was early recognized as necessary knowledge, yet the people regarded it in the light of special knowledge, somewhat detrimental to broad education. Applied science, such as engineering, was for a long time looked upon in the same way, with the additional stigma of mistrust. Pure science was considered rather as a hobby for men with sufficient means, dangerous in so far as it inclined to produce a critical attitude toward religion and the established order of things, undesirable inasmuch as it did not open any other field for activity than an academic career, and insufficient as a general basis for broad education. In the second half of the past century pure science came into its own, conquered the opposition of society.

Yet the fact remains, Russia has in spite of these limitations produced a galaxy of scientists and scholars in the history of science comparable to those in any country. A brief list of these great leaders will convince one that in the face of opposition success can be attained. In the words of Lessing, the great German philosopher, opposition makes for strength. Nikolai I. Lobatschewskiĭ [1793–1856] in mathematics, particularly in non-Euclidean geometry; Dmítri I. Mendeléev, [1834–1907] in chemistry, particularly the periodic tables of the chemical elements; Ivan P. Pavlov [1849–1936] in physiology, the study of brain functions; F. G. Wilhelm Struve [1793–1864] and Otto Wilhelm Struve [1819–1905] in astronomy, parallax and double star studies—these names and many others will live in the memory of man, par-

ticularly in the great tradition of Russian scientific achievement. This is demonstrated again not alone in the names that have just been given, but by the leaders that are dominating the U.S.S.R. progress in science to-day. These leaders are not alone contributing to the war but to peace as well, and thus rendering a notable service to their country.

During the World War I or the Revolution of 1918, the Government of Russia was transferred from Leningrad to Moscow, but it was not until 1934 that the Academy of Science was also transferred. The forward-looking Russian scholars had planned a much larger and more modern structure built upon classical Greek motif; the World War II has delayed this program also. However, to-day the academy consists of approximately 136 academicians, more than 30 honorary academicians, about 224 corresponding members and over 5,000 scientific and technical assistants. Sixteen American scientists are now honorary or corresponding members of the academy. The portraits of some of the more prominent academicians have been included in the library's exhibition through the cooperation of the Embassy of the U.S.S.R. in Washington. Representative volumes of the more important works by members of the academy have been selected for display from the extensive collection of Russian materials in the Library of Congress, probably the richest to be found in any library in the Western Hemisphere.

The organization of the academy groups its activities in eight departments, to each of which a section of the library's exhibit is devoted: the departments of physico-mathematical, chemical, geology-geographical, biological and technical sciences, history, and philosophy, economy and law, and language and literature. Under these eight departments, the academy maintains 76 institutions, 11 laboratories, 47 stations, 6 observatories and 24 museums. There are also eight branches of the Academy of Sciences throughout the Soviet Union, under the supervision of which are 39 institutes, 28 stations, 3 astronomical observatories, 8 botanical gardens, 3 sanctuaries and 17 other scientific research establishments. The exhibit includes publications issued by each of the departments of the academy and some of its branches.

The peacetime work of the academy was suddenly interrupted on June 22, 1941, when Germany invaded Russia. From the very beginning of the invasion, the Academy of Sciences readjusted its activities to place its resources fully behind the Russian war effort. Even while Moscow was under heavy German attack, the institution continued the publication of its learned journals and texts. Books printed while the city was under Nazi bombardment are among those shown in the library's display.

Under the academy's direction, chemists have pioneered in manufacturing synthetic rubber, in photochemistry, in developing winter lubrications for tanks and planes, in producing new explosives and in extending the uses of helium. Soviet geologists have turned their energies to the problem of supplementing the stock of raw materials required by the Russian war machine, and agronomists have increased the productivity of agriculture. Physiologists and physicians of the U.S.S.R. have won international fame for their treatment of shock, tetanus, gangrene and other war maladies, and dieticians have found new nutritive substances, as well as new sources of vitamins, which have been used to help solve the food problems resulting from the war. Technologists have also scored notable successes in finding substitutes for scarce materials, in simplifying technological processes and perfecting the organization of war industries. Most of these activities are represented in one way or another by publications on display.

Exhibited items of particular interest include the first volume of transactions published by the academy, the "Commentarii academiae scientiarum imperialis petropolitanae," published in 1728 at St. Petersburg; pictures of the first building of the academy in Leningrad, its present home in Moscow to which it moved in 1934, and the architect's drawing of its proposed new building; numerous publications of various scientific establishments attached to the General Assembly, and current periodicals concerning the academy as a whole. It is interesting to note that, while the publications of the academy are published mainly in Russian, a number have been published in English as well, while others have titles and summaries in English. M. V. Lomonosov, whose portrait appears in the historical section of the exhibit, is described as "probably the most interesting figure in the whole existence of the academy."

The academy's usefulness and influence under conditions never before experienced by man are indeed most remarkable in the annals of the history of science. The administration and various functions of the Soviet Academy are directed by the following well-known scientists and scholars: Vladimir Komarov, botanist, is president of the Academy of Sciences of the U.S.S.R. since 1936. Abram Joffe, vice-president of the Academy of Sciences and director of the Leningrad Physico-Technical Institute, is known for his researches in the field of electron semi-conductors. Alexander Baikov, first vice-president of the Academy of Sciences, is an expert on astringents, metallurgy and metallography. Peter Kapitsa, physicist, is director of the Institute of Physical Problems of the Academy of Sciences. From 1921–35 Kapitsa worked in Lord Rutherford's laboratory in Cambridge. Sergei

Vavilov, physicist, is director of the Lebedev Physics Institute of the Academy of Sciences and chief of scientific research work of the State Institute of Optics. Ivan Vinogradov, outstanding Russian mathematician, is known for his new theory of numbers and his solution of the famous Goldbach problem. He is a member of the Royal Society of London and honorary member of the London and other mathematical societies. Leon Orbeli, vice-president of the Academy of Sciences, is head of the Institute of Higher Nervous Activity and of the Biological Station in Pavlovo. Trofim Lysenko is president of the All-Union Lenin Academy of Agricultural Sciences and vice-chairman of the Supreme Soviet of the U.S.S.R. Dmitri Prîanishnikov, founder of Russia agro-chemistry, has published more than 360 papers and written text-books on agro-chemistry and agriculture. Alexei Favorskiĭ is well known in the field of organic chemistry, in which he created a new branch . . . the chemistry of acetylene and its derivatives. Vladimir Obruchev, Russian geologist and geographer, author of 300 works, among the most important of which are "Ore Deposits" and "The History of Geological Research in Siberia." Eugene Tarle, historian, is the author of many volumes on the history of the West and of Russia, including "Invasion of Russia by Napoleon in 1812," "The Working Class of France During the Revolutionary Epoch." Vîacheslav Volgin, vice-president of the Academy of Sciences, is a historian-sociologist. Nikolai Derzhavin, member of the Presidium of the Academy of Sciences, is a philologist, scholar of the Slav languages and of the history of literature. Alexei Tolstoi, member of the Academy of Sciences, is one of the foremost Soviet authors. His works include the long novel "Peter the Great."

One of the most interesting and historically significant facts bearing upon the new "Renaissance" of Russia is the ability of her people during her most trying period to advance nationally through the progress of science. Shortly before and during this present conflict, the Russian scholars have selected the historical medium for advancement by paying gracious tribute to England and the English-speaking world by acknowledging the work of the greatest figure in the history of physical science, namely, that of Sir Isaac Newton.

Under Peter the Great, there was some development in practical mathematics, but with the imported scholars, particularly after the founding of the Academy of Sciences in 1725, pure mathematics made some progress. Interest in astronomy, physics and biological sciences followed in rapid order.

In the academy's various publications, such as the Commentarii, Novi Commentarii, Acta, Nova Acta and Mémoires de l'Académie Impériale des Sciences, the contributions became more sound in scholarly importance and practical interpretation. We note that the works of Daniel and Jean Bernouilli, Leonard Euler and others in celestial mechanics and mathematical physics were most prominent. However, the influence of Newtonian philosophy made no great progress in Russia at this time. In contemporary France and Germany, Newton was rapidly accepted. The cause of this neglect of Newton in the vigorous new life of Russian interest in mathematical science is not apparent. It was not until two centuries later that formal recognition of Newton became evident. In 1927, Newton's "Optics" ("Optika ili traktat . . . sveta," S. I. Vavilov) was translated into the Russian language. In 1931, at the International Congress of the History of Science and Technology, held in London, the delegates of the U.S.S.R. presented a series of addresses in which it was shown that Newton's philosophy appeared to have influenced social consciousness, through the Marxian doctrine of social change and methods of production. That is, "the method of production of material existence conditions the social, political and intellectual process of the life of society."

Further expression of appreciation of Newton's works and influence on scientific thought is indicated by a translation in 1936 into Russian of the "Principia," first edition, namely: "Matematicheskie nachala natural'noi filosofii. Perevod s latinskogo," A. N. Krylova. This was followed by another translation of Newton's principal work in pure mathematics: "Matematicheskie raboty. Perevod s latinskogo," D. D. Mordukhai-Boltovskogo. In 1943 two publications were produced: one an interesting Russian interpretation of Newton's life, namely, "Isaak N'iuton," by S. I. Vavilov; and the other a volume containing eighteen papers given at a symposium in commemoration of the tercentenary of Newton's birth. These addresses were given by the leading scholars and scientists of Russia, more or less familiar to the American public.

The Embassy of the U.S.S.R. has just announced through its bulletin of information dated May 6, 1944, that fifteen Isaac Newton Scholarships for students in the mathematics and physics department of Soviet higher educational institutes were recently established by the People's Commissariat of Education. Three of the scholarships have been awarded to students of Moscow University. The Scientific Council of the University selected two girl students of mathematics and a student of physics as the most deserving candidates for the scholarships.

As a further expression of cordiality between the Soviet government and the British government, there took place in Moscow on January 6, 1944, an inter-

esting ceremony. This manifestation was in the form of a beautiful and specially bound copy of Newton's "Principia," presented by the Royal Society of London to the Academy of Sciences of the U.S.S.R. Accompanying this volume there was an original draft of a letter by Newton to Prince Alexander Menshikov, acquainting the latter with his election into the fellowship of the Royal Society in 1714. The prince was the first Russian to be elected to the Royal Society.

OBITUARY

CHARLES BENEDICT DAVENPORT

Charles Benedict Davenport was born in Stamford, Conn., on June 1, 1866, and died on February 18, 1944, at the age of 77. He was tutored by his father, a former teacher, until he was fourteen years old. At that age he entered the Brooklyn Polytechnic Institute, where he received the B.S. degree in 1886. During the following year he was a member of the engineering corps engaged in surveying the Duluth, South Shore and Atlantic Railroad. He entered Harvard in 1887, received an A.B. in 1889 and a Ph.D. in 1892. At Harvard he served as assistant in zoology from 1887 to 1893 and as instructor from 1893 to 1899. In the latter year he became assistant professor of zoology at the University of Chicago and was associate professor there from 1901 to 1904. He was director of the Biological Laboratory at Cold Spring Harbor from 1898 to 1923. In 1904 Dr. Davenport was appointed director of the newly established Department of Experimental Evolution, Carnegie Institution of Washington, at Cold Spring Harbor, Long Island, N. Y. This post he held for thirty years, till his retirement in 1934.

Dr. Davenport early became one of the world's leaders in the new science of genetics. In three different ways he made important contributions to science: by investigation of biological phenomena, more particularly of the laws of heredity in domestic animals and man; by the organization of facilities for research upon animal, plant and human heredity; and by the publication of many books and monographs on heredity, anthropology and statistical methods in biology. In the earlier part of his career he gave particular attention to experimental morphology, to the statistics of variability, to the role of water in the growth of organisms, to the acclimatization of organisms to poison and heat, and to kindred questions regarding the lower animals. Later, however, his studies were conducted wholly on higher vertebrates and man. In 1910, at Cold Spring Harbor, he organized the Eugenics Record Office, a clearing house for data on inheritable traits of American families and for giving advice to individuals on marriage and to states on defective communities. The facilities of the Record Office led to the discovery of the method of heredity of epilepsy in man, how it is produced and how in later generations it may be prevented; also, to the method of inheritance of eye color, hair color, skin pigmentation and other characteristics in man. These studies were preceded by his purely experimental studies conducted on poultry, sheep and canaries. His studies on a very wide variety of animal and human materials notably increased our knowledge of the role of the genes in animal and human development.

During two to four decades Dr. Davenport served as editor or associate editor of several journals devoted to zoology, genetics, eugenics and anthropology. Among his published books the following are notable: "Experimental Morphology," Parts 1 and 2; "Statistical Methods in Biological Variation"; "Introduction to Zoology" (with Gertrude C. Davenport); "Inheritance in Poultry"; "Inheritance in Canaries"; "Inheritance of Characteristics in Domestic Fowl"; "Eugenics, the Science of Human Improvement by Better Breeding"; "Heredity in Relation to Eugenics"; "Heredity of Skin-Color in Negro-White Crosses"; "The Feebly Inhibited, Nomadism and Temperament"; "Naval Officers, Their Heredity and Development" (with M. T. Scudder); "Physical Examination of the First Million Draft Recruits; Methods and Results" (with Colonel A. S. Love); "Defects Found in Drafted Men" (with Colonel Love); "Army Anthropology" (with Colonel Love); "Body Build and Its Inheritance"; "The Nam Family" (with A. H. Estabrook); "Race Crossing in Jamaica" (with M. Steggerda); "The Genetical Factor in Endemic Goiter"; "How We Came by Our Bodies."

This partial list of his books reflects both the broad interests and the phenomenal energy of the man. Few men have applied themselves more continuously or more ardently to research. Few men could successfully withstand, as he did, the physical stress to which he regularly subjected himself. His retirement as director of a research institution involved no slackening in the pursuit of his own investigations. For Dr. Davenport life was, above all, opportunity for insistent, driving inquiry.

Dr. Davenport was a member of numerous American and foreign scientific societies. In 1923 he received the gold medal of the National Institute of Social Sciences. During World War I, he served as a Major in the Office of the Surgeon General, U. S. Army. He was active in many civic enterprises, and in 1942 he helped establish the Cold Spring Harbor

Whaling Museum, of which he was a director and curator. Shortly before his death a whale was found on a Long Island beach; Dr. Davenport secured its head, and in the process of preparing the skull for exhibition and study he caught a cold which led to a fatal pneumonia.

Those who intimately knew Charles Davenport well know that he was never too busy to give encouragement, counsel and help to younger biologists who brought their problems to him. This large group of men and women, his neighbors, and his many associates in the institutions which he served so long will long remember the rare kindliness and modesty of the tireless man and scientist who daily strove to bring his tasks to a worthy end.

OSCAR RIDDLE

LEROY SHELDON PALMER
1887–1944

THE passing away on March 8 of Leroy Sheldon Palmer, chief of the division of agricultural biochemistry of the University of Minnesota, came as a great shock to his associates and many friends. Dr. Palmer was stricken almost immediately on reaching his office on February 25th and taken to the University Hospital, where death came to him 12 days later from a coronary occlusion.

Dr. Palmer, born at Rushville, Illinois, on March 23, 1887, was the son of Samuel C. and Annie Goodman Palmer and the twin brother of Robert C. Palmer, now a chemist and director of research in the Newport Company of Pensacola, Florida. After receiving his B.S. degree in chemical engineering from the University of Missouri in 1909 he became interested in dairy chemistry, and continuing his studies at that university acquired his M.S. degree in 1911 and his Ph.D. degree in 1913. He served on the teaching staff of the University of Missouri until 1919, during which time he formed a research partnership with the late Dr. C. H. Eckles which carried over into many fruitful years of dairy research at the University of Minnesota.

Dr. Palmer came to the University of Minnesota in 1919 as associate professor of dairy chemistry and soon became professor of dairy chemistry and animal nutrition. After the death of Dr. Ross Aiken Gortner in 1942 he was appointed chief of the division of agricultural biochemistry.

On coming to Minnesota, Dr. Palmer at once began his research in dairy chemistry which has dealt with the chemistry of milk and dairy products, their composition as affected by the nutrition of the animal, the physical and colloidal chemistry of milk, the chemistry of rennet coagulation, the churning process and many other theoretical phases of milk chemistry. At this same time he also planned extensive research with the late Dr. C. H. Eckles, of the division of dairy husbandry, in dairy cattle nutrition, especially mineral and vitamin nutrition of bovines. He was still cooperating in this research at the time of his passing. His nutrition studies were not confined to dairy cattle but extended into the broader field of animal nutrition in which research is conducted with the small laboratory animal. He was always more interested in the fundamental problems of nutrition than in those problems which could be quickly solved. Thus research which was conceived in the early twenties is still in progress.

Dr. Palmer's contributions to scientific journals number more than 166, and he had also written or made important contributions to seven books. However, his major contribution to science has been through his students, of whom 19 received the M.S. degree and 42 the Ph.D. degree at this university. The success attained by these students testifies to the truthfulness of this statement. He gave freely and liberally of his time and thought to the problems of his graduate students and was a teacher well loved and respected both by the older postgraduate and the younger undergraduate groups. He possessed not only the method and spirit of true graduate work but also a keen intellect and mature judgment, which made him an invaluable counselor. He was always critical in his examination of scientific research, but his criticism never carried a sting. He never failed to help with suggestion and advice and all those who were associated with him worked with a zest and happiness which could only be inspired by a truly great leader.

Dr. Palmer was selected in 1939 as the first recipient of the Borden Award for outstanding research in the chemistry of milk. The standards governing the presentation of the award are high. Only research of the most significant nature is deemed worthy of the award.

Dr. Palmer's scientific achievements won him membership in the leading scientific societies and honorary fraternities in the country. Besides his service on the staff of the *Journal of Dairy Science* as associate editor, he has acted in the capacity of counselor for the American Chemical Society and chairman of the Minnesota Section of this society, vice-president of the World's Dairy Congress (1923), president of the Minnesota Chapter of Sigma Xi, consultant to the American Medical Association and collaborator in the U. S. Pharmacopoeia Vitamin Standardization Committee (1937).

Dr. Palmer's life was not entirely given to study and research. He loved outdoor life and a round of golf; a day of fishing or a long drive through beautiful country gave him the keenest pleasure. He had a fine appreciation of music and literature and spent many quiet evenings in his home reading and listening to radio broadcasts by our great artists. He liked

people and took great pleasure in having his friends in his home, where he was always at his best as a kind and friendly host.

It is with heavy hearts that his associates in the division of agricultural biochemistry carry on the traditions of the department he helped to build.

Cornelia Kennedy
University of Minnesota

DEATHS AND MEMORIALS

Dr. Conrad Engerud Tharaldsen, professor of anatomy and director of the William Waldo Blackman department of anatomy of the New York Medical College, died on May 20 at the age of sixty years.

In commemoration of the twentieth anniversary of the death of Dr. Ernest Fox Nichols, who was from 1892 to 1898 professor of physics at Colgate University, his portrait has been presented to the university by Mrs. Nichols.

Rolf Singer, assistant curator of the Farlow Herbarium of Harvard University, writes: "We have just received word from friends in Leningrad that Professor Woldemar H. Tranzschel, the most famous mycologist of Russia and specialist of the highest international standing, died during the siege of Leningrad late in 1942. His work on rusts was of high theoretical importance and of immediate practical value for his native country. He was highly honored by the Academy of Sciences of the U. S. S. R., where he had worked during most of his lifetime. He was loved by his numerous pupils and collaborators. Two genera of fungi, *Tranzschelia* and *Tranzscheliella,* were named in his honor, and uredinists of all countries are familiar with his discovery of a relationship between the taxonomy and the ecology of certain types of rust, the so-called Tranzschel-rule. W. Tranzschel cultivated scientific exchange with American mycologists. He is one of the truly irreplaceable victims of total war."

At a meeting of the council of the American Mathematical Society held on April 29, the death on January 10 of Professor Thomas Scott Fiske, of Columbia University, was announced and appropriate resolutions were adopted. In 1888 through the efforts of Professor Fiske, then a young man of twenty-three years, the New York Mathematical Society was established. Three years later the name was changed to American Mathematical Society. Professor Fiske held the following offices in the society: *Secretary,* 1888–1895; *Treasurer,* 1898–1901; *President,* 1903–1904. He was present at the semicentennial celebration meeting in 1938 of the society he had founded.

SCIENTIFIC EVENTS

THE HALL OF MEXICAN AND CENTRAL AMERICAN ARCHEOLOGY OF THE AMERICAN MUSEUM OF NATURAL HISTORY

The American Museum of Natural History has recently reopened its Hall of Mexican and Central American Archeology after a complete revision and reinstallation of the exhibits. Although wartime restrictions prevented any extensive alterations in the architectural decor, it was possible to effect a vast improvement not only in the appearance of the exhibits, but in their educational value. The hall is approached through a foyer where a series of five miniature groups presents the ecological variety of Mexico and Central America and illustrates for the visitor the settings in which the prehistoric cultures of the region flourished. Also in this section, fine individual examples of prehistoric art in the form of gold ornaments, jade carvings and pottery are displayed in illuminated niches sunk into the wall.

The hall itself is arranged to serve two interests, that of the casual visitor who wants simply to get an overall picture of the extent and nature of the civilizations of Mexico and Central America and that of the student who wishes to study the collections in detail. For the former a series of illuminated cases containing representative examples of the prehistoric art is deployed on either side of the main axis of the hall. The visitor may, therefore, by walking through the hall gather a visual picture of the character of the native cultures as reflected in their stone work, their pottery and their figurines. Supplementing these exhibits are deep wall cases at either end of the hall, where the famous Stephens Collection of Maya Art and other fine collections are on display, lighted from within the cases.

Along the sides of the hall the analytical exhibits are on view in a number of alcoves. These were designed primarily for the students who frequent the exhibits and for those visitors whose deeper interest might be aroused by the central exhibits. In these cases the various local cultures are defined by typical specimens, their stylistic variations are clarified and their growth and development explained. The complete stratigraphic sequence for the Valley of Mexico is here for the first time placed on view.

Casts of large monuments, stelae and altar stones, architectural models and original stone sculptures are dispersed throughout the hall to supplement the case exhibits. This rearrangement, together with the use

of case lighting and the device of painting the walls and the cases in the same color, lends a greater visibility to the specimens than they previously enjoyed.

The Hall of Mexican and Central American Archeology is under the charge of the Department of Anthropology, of which Dr. Harry L. Shapiro is chairman. The revision of the exhibits was planned and executed by Dr. Gordon F. Ekholm, assistant curator, and Clarence L. Hay, research associate. They were assisted by Victor Ronfeldt, Miss Katharine Beneker, Joseph M. Guerry and Matthew Kalmenoff.

THE MUNSELL FOUNDATION TO PROMOTE COLOR STANDARDIZATION

It is reported in *Industrial Standardization* that the promotion of color standardization, nomenclature and specification is one of the primary objects of the Munsell Color Foundation, Inc., which was organized recently. The foundation will also encourage the application of scientific knowledge to color problems arising in science, art and industry.

The foundation is a non-profit organization, which will have a board of trustees, one of whom is to be a member of the staff of the National Bureau of Standards; one to be appointed by the executive committee of the Inter-Society Color Council; one by the manager of the Munsell Color Company; one to be the representative of the Munsell family, and three trustees at large.

Deane B. Judd is the first trustee of the new foundation to be appointed by the director of the National Bureau of Standards, and Loyd A. Jones, nominated by the Optical Society of America, is one of the trustees at large. Both Dr. Judd and Mr. Jones are active in technical committees working on American standards under the procedure of the American Standards Association.

The American War Standard on Specification and Description of Color, approved by the American Standards Association in 1942, recognizes the Munsell Book of Color as the only system of material color standards calibrated in terms of the basic specification—the percentage of light reflected or transmitted by the color, as determined by the spectrophotometer. The system of color names of the Inter-Society Color Council–National Bureau of Standards is also based on the Munsell system.

THE NORTH CAROLINA STATE COLLEGE CHAPTER OF THE SOCIETY OF THE SIGMA XI

The Sigma Xi Club at North Carolina State College has become the North Carolina State College Chapter of the Society of Sigma Xi. The installation took place on April 17 in the college Y. M. C. A. auditorium. The activities of the day began with a business meeting, with Dr. George A. Baitsell, executive secretary of the national chapter, presiding. The constitution for the new chapter was adopted, charter members signed the constitution and the following were elected officers: Dr. Ralph W. Cummings, head of the department of agronomy, *President;* Dr. G. Wallace Smith, head of the department of engineering mechanics, *Vice-president;* Dr. Samuel G. Lehman, professor of plant pathology, *Secretary;* Dr. William G. Van Note, associate professor of metallurgy, *Treasurer;* Professor L. L. Vaughn, dean of the Engineering School, and Dr. F. H. McCutcheon, professor of zoology, *Members of the Executive Committee.*

At the installation ceremony the petition for the new chapter was presented by Dr. F. H. McCutcheon, retiring president of the club. This was accepted on behalf of the national society by Dr. Baitsell, who reviewed the grounds for installation of the chapter and presented the charter. Dr. Ernest Carroll Faust, a member of the National Executive Committee, made the installation address, presenting the charge to the new chapter. Dr. Cummings accepted the charter and made the response for the petitioning group. Colonel John W. Harrelson, dean of administration, reviewed the advancements and achievements in research of the college and pledged the administration to increased support of research in the future.

Following the formal installation, a reception for members and delegates was held at the home of Colonel and Mrs. Harrelson. In the evening a dinner was served for the national officers, visiting delegates, chapter members and their wives. Following the dinner, Dr. Ernest Carroll Faust delivered an address entitled "Some Biological Interrelationships."

ELECTIONS OF THE NATIONAL ACADEMY OF SCIENCES

Elections at the spring meeting of the National Academy of Sciences held in Washington on April 25 are:

Treasurer: Dr. J. C. Hunsaker, Massachusetts Institute of Technology (for a further term of four years; ending June 30, 1948).

Members of the Council (for terms of three years ending June 30, 1947):

Ernest W. Goodpasture, Vanderbilt University.

Irving Langmuir, General Electric Company, Schenectady, New York.

New Foreign Associates:

Edward B. Bailey, Geological Survey, Exhibition Road, S. W. 7, London, England.

Leopold Ruzicka, Department of Organic Chemistry, Institute of Technology, Zurich, Switzerland.

New Members:

Thomas Addis, Stanford University Medical School, San Francisco.

Charles Armstrong, United States National Institute of Health, Washington, D. C.
Philip Bard, the Johns Hopkins University School of Medicine.
George Wells Beadle, Stanford University.
Hans A. Bethe, Cornell University.
Edward U. Condon, Westinghouse Research Laboratory, East Pittsburgh.
George O. Curme, Jr., Carbide and Carbon Chemicals Corporation, New York, N. Y.
Hugh L. Dryden, National Bureau of Standards, Washington, D. C.
Carl Owen Dunbar, Yale University.
Vincent du Vigneaud, Cornell University Medical College, New York, N. Y.
James Franck, University of Chicago.
Reynold C. Fuson, University of Illinois.
Edwin Bret Hart, University of Wisconsin.
Selig Hecht, Columbia University.
Alfred H. Joy, Mt. Wilson Observatory, Pasadena.
Esper Signius Larsen, Jr., Harvard University.
James B. Macelwane, St. Louis University.
Leonard A. Maynard, Cornell University.
Barbara McClintock, Department of Genetics, Carnegie Institution of Washington, Cold Spring Harbor.
C. R. Moore, University of Chicago.
Alfred S. Romer, Harvard University.
Louis B. Slichter, Massachusetts Institute of Technology.
Lee I. Smith, University of Minnesota.
Don M. Yost, California Institute of Technology.
Oscar Zariski, the Johns Hopkins University.

SCIENTIFIC NOTES AND NEWS

THE Remington Honor Medal for 1944 has been awarded by the New York Branch of the American Pharmaceutical Association to Dr. H. Evert Kendig, dean of the School of Pharmacy of Temple University. The medal is conferred each year for work carried out during the preceding year, or culminating over a period of years, that is judged to be the most important to American pharmacy.

THE Lamme Medal for "outstanding engineering achievement" for 1944 has been awarded by the Ohio State University to Henry M. Williams, of Dayton, Ohio, since 1938 vice-president of the National Cash Register Company in charge of engineering and research. The presentation will be made in June during the commencement of the university.

THE James Ewing Award of the Westchester County, N. Y., Medical Society, was presented on May 16 to Dr. Richard Charlton, for fifteen years chairman of the Westchester Cancer Committee of the American Society for the Control of Cancer.

IN connection with the presentation on April 14 of the Gold Medal of the Royal Astronomical Society to Dr. Otto Struve, as reported in *The Times,* London, Professor E. A. Milne, president of the society, called attention to the circumstance "that this was the fourth time an astronomical member of the Struve family had been awarded the gold medal of the society. It had been received four times in a hundred and eighteen years, or once in each generation."

AT the presentation on May 31 to Dr. George O. Curme, Jr., of the Willard Gibbs Medal of the Chicago Section of the American Chemical Society, Dr. L. M. Henderson, of the Pure Oil Company, chairman of the section, spoke on "The Willard Gibbs Medal," and J. G. Davidson, vice-president of the Carbide and Carbon Chemicals Corporation, discussed "The Medalist." Dr. Charles L. Parsons, of Washington, D. C., secretary of the American Chemical Society, made the presentation.

DR. E. A. MILNE, Rouse Ball professor of mathematics at the University of Oxford, has been elected president of the Royal Astronomical Society.

DR. HOMER L. DODGE, professor of physics at the University of Oklahoma, dean of the Graduate School and director of the University of Oklahoma Research Institute, has been elected the eighteenth president of Norwich University, Northfield, Vt. Since 1942 Dr. Dodge has been on leave of absence to serve as director of the Office of Scientific Personnel of the National Research Council. He will assume his duties as president on August 1. Norwich University is a military college with basic curricula in liberal arts and engineering. The one hundred and twenty-fifth anniversary of its founding will be celebrated on August 6 with Colonel Herman Beukema, formerly director of the Army Specialized Training Program and now of the U. S. Military Academy at West Point, as the principal speaker.

DR. WILLIAM KING GREGORY, curator of the departments of comparative anatomy and fishes of the American Museum of Natural History, New York City, having reached the retirement age, has resigned as head of these departments. Dr. Gregory has been a member of the scientific staff of the museum since 1900. Dr. Charles M. Breder, who was appointed curator of fishes last December, will become chairman of the department.

DR. WILTON M. KROGMAN, associate professor of anatomy and physical anthropology at the University of Chicago, has been appointed research associate in physical anthropology of the Chicago Natural History Museum and Professor Hanford Tiffany, head of the

department of botany at Northwestern University, has been appointed research associate in cryptogamic botany.

DR. ALONZO QUINN, associate professor of geology at Brown University, has been elected vice-chairman of the Council on Mineral Industries of New York and the New England States.

DR. HERMAN C. MASON, associate professor of bacteriology and immunology at the College of Medicine of the University of North Carolina, has resigned to accept a position with the Schering Corporation of Montclair, N. J.

CLARENCE W. SONDERN, research director of George A. Breon and Company, has become director of laboratories at the White Laboratories, Inc., Newark, N. J.

ATHERTON LEE, from 1934 to 1941 director of the Experiment Station in Puerto Rico of the U. S. Department of Agriculture, later chief of the National Rubber Division of the War Production Board, has become associated with the United Fruit Company.

BERNICE S. BRONNER, formerly head of the textile laboratory of the Good Housekeeping Institute, has joined the staff of the American Standards Association with the title of textile technologist.

DR. HAROLD J. ROSE, vice-president in charge of research of Anthracite Industries, Inc., New York, has resigned to assume a similar position with Bituminous Coal Research, Inc., at Pittsburgh. He will be in charge of a five-year program, on which it is planned to expend $2,000,000 for research and the development of coal production and utilization to meet wartime problems and to strengthen the postwar position.

PROFESSOR NELSON S. HIBSHMAN, head of the department of electrical engineering of New York University, has been appointed director of the School of Science and Technology of the Pratt Institute, Brooklyn, N. Y.

PROFESSOR SUMNER C. BROOKS and Dr. Matilda Moldenhauer Brooks, of the University of California at Berkeley, have returned to the United States from a six-months visit to South America. They lectured at various universities and academies of science in Lima, Peru, Buenos Aires, Montevideo and Rio de Janeiro under the auspices of the Cultural Relations Division of the Coordinator of Inter-American Affairs Committee. The subject of the lectures was "The Ultra-structure, Permeability and Accumulation of Salts in Living Cells" and "Oxidation-reductions in Living Cells."

BENJAMIN Y. MORRISON, of the Office of Foreign Agricultural Relations, is in Colombia, where he is assisting in the coordination of the agricultural research program, especially as it relates to the production of cinchona. He will collaborate with the proposed development corporation, the Caja de Crédito Agrario Industrial y Monero, and the Ministry of National Economy as a consultant on research related to agriculture wherever such work is carried on by the Colombian Government.

EDWARD L. TANNER, of the Office of Foreign Agricultural Relations, has been assigned to the Cooperative Experiment Station in Nicaragua to conduct agronomic work on coconuts, sesame and other oil-yielding plants, on rice and on abacá.

DR. ANATOL A. SMORODINTZEV, head of the department of virus diseases of the Institute of Experimental Medicine in Moscow, gave on May 26 the Cutter Lecture on Preventive Medicine at the Harvard Medical School. The lecture was entitled "New Forms of Encephalitis in the U.S.S.R." Dr. Smorodintzev is in America as a guest of the Rockefeller Foundation.

DR. WM. H. HOBBS, professor emeritus of geology of the University of Michigan, delivered on May 12 the annual address before the University of Cincinnati Chapter of Sigma Xi. It was entitled "The North American Glaciation in the Light of Studies of the Greenland Glacier." On May 14 he gave an illustrated lecture on "The Island Fortresses of the Pacific."

PROFESSOR MARSTON T. BOGERT, of the department of chemistry of Columbia University, gave on April 27 an address at Poughkeepsie before the Mid-Hudson Section of the American Chemical Society. The address was entitled "Malaria, Mankind's Public Enemy No. 1."

DR. LAURENCE H. SNYDER, chairman of the department of zoology and entomology of the Ohio State University, addressed on May 10 the combined chapters of Phi Beta Kappa, Sigma Xi and Phi Kappa Phi of the University of Utah. On May 11 he addressed the student body at Brigham Young University. "Medical Genetics" was the subject of both lectures.

DR. WALTER R. MILES, professor of psychology in the School of Medicine of Yale University, on May 1 presented an illustrated lecture on "Aviation Psychology" under the auspices of the newly installed chapter at Vanderbilt University of the Society of the Sigma Xi.

THE four hundred and third meeting of the American Mathematical Society was held at Columbia University on April 28 and 29. The attendance was about two hundred, including one hundred and sev-

enty-eight members of the society. The three following addresses were given by invitation of the Program Committee: "Mathematical Aspects of the Boundary Layer Theory," by Professor K. O. Friedrichs, of New York University; "The Structure of Normed Abelian Rings," by Professor E. R. Lorch, of Columbia University, and "Modern Algebra and the Riemann Hypothesis," by Professor André Weil, of Lehigh University.

AN Institute on Dental Health Economics, of which Dr. Kenneth A. Easlick will be the chairman, will be held from June 26 to July 1 by the School of Public Health of the University of Michigan.

THE Pan American Union has announced the publication of a new series of ten volumes entitled "Higher Education in Latin America," to be issued by the Division of Intellectual Cooperation. The series has been made possible through a grant from the Rockefeller Foundation.

THE National Electrical Manufacturers Association is reported by *Industrial Standardization* to have made arrangements for the distribution throughout Latin America of a large number of copies of a Spanish edition of the National Electrical Code. It is believed that the translation of this code will be helpful in promoting Pan-American cooperation in standardization activities. The documents will be distributed by the office at Buenos Aires of the Inter-American Department of the American Standards Association.

IT is announced that the Textile Research Institute, New York City, has purchased the Morton estate at Princeton, N. J., for conversion into laboratories. The property includes an eighteen-room stone house on the north side of Lake Carnegie. As soon as the necessary changes can be made in the building, the research work of the Textile Foundation, now at the Bureau of Standards, Washington, will be transferred to Princeton. It will continue under the direction of Dr. Milton Harris, who is director of research for both the foundation and for the institute.

IT is reported in the *British Medical Journal* that a Swiss Society for Tropical Medicine has been founded at Berne under the presidency of Dr. P. Thillot, of Lausanne, and that an Institute for Tropical Medicine has been founded at Basle.

ACCORDING to a communication dated April 10 from the Delhi correspondent of *The Times*, London, Professor A. V. Hill, secretary of the Royal Society, who was expecting to return to England after a stay of five months in India, stated that a visit of Indian scientific men to England had been arranged to take place in May. The delegation includes Colonel Batra, deputy Director-General, Indian Medical Service; Sir S. S. Bhatnagar, director of the Board of Scientific and Industrial Research; Sir J. P. Ghosh, of the Bangalore Institute, and two physicists, Professor S. K. Mitra and Professor M. M. Sar, of Calcutta. *The Times* reports that in speaking of the scientific aspect of the national development of India —upon which he had been asked to advise the Government—Professor Hill "emphasized the need of a great increase of scientific education, particularly in the higher stages. That would involve that young Indian scientists, engineers and doctors should go abroad for advanced study and training, and that specialized institutions should be set up in India where people could be trained to the high standards required to-day. The natural resources of India were very great, but nobody knew exactly what or where they were. The zoological survey of India was at present little more than a museum, and the botanical survey had not had a director for the past seven years. He wanted to see more research carried out in the teaching institutions, and a strong central organization for dealing with problems of research. Public health required attention most urgently. According to the last published census returns, 450 children out of every 1,000 died before they reached the age of 15, and too many people in India died from preventable diseases."

ACCORDING to the daily press, an agreement has been reached between China and the United States under which China is to receive American assistance in the development of her agricultural and forestry enterprises. China will send from ten to twenty-five technicians to America for advanced study and practical training, and the United States will appropriate lend-lease funds for the purchase of agricultural equipment for China.

DISCUSSION

STREAM DOUBLE REFRACTION STUDIES ON THE ORIENTATION OF TOBACCO MOSAIC VIRUS PARTICLES

IN earlier publications[1, 2] we reported that sols streaming horizontally from a small tube (.5 mm inside diameter) through a vessel containing the sol show double refraction throughout the width of the stream if the particles are rod-shaped, and only along

[1] W. N. Takahashi and T. E. Rawlins, *Proc. Soc. Exper. Biol. and Med.*, 30: 155, 1932.

[2] W. N. Takahashi and T. E. Rawlins, SCIENCE, 77: 26, 1933.

the edges of the stream if the particles are plate or disk-shaped. It was assumed that in all cases the longest axis of the particles was oriented parallel to the direction of flow, and that the flat surfaces of plate or disk-shaped particles were parallel to the surface of the cylindrical tube. Disk-shaped particles show maximum form double refraction when the transmission direction of the incident light is parallel to the flat faces of the disks and minimum double refraction when perpendicular to the flat faces. Light transmitted in a vertical direction should therefore produce strongest double refraction along the edges of the stream where most of the particles have their flat surfaces vertical and should produce minimum double refraction in the middle portion where most particles in the upper and lower regions of the cylindrical stream have their flat surfaces in a horizontal position.

We have recently modified the technic by using several types of compensators in studying the magnitude of the birefringence and the orientation of particles. Evidence has thereby been obtained indicating that our above conclusions should be modified to some extent. These studies indicate that flowing rod-shaped particles of tobacco mosaic virus do not produce uniform birefringence throughout the width of the stream but show less birefringence in a narrow central portion of the stream than in adjacent regions on each side of the center. In the regions showing strongest birefringence tobacco virus particles were not found to be exactly parallel to the direction of flow but to have their forward ends tilted toward the middle of the stream at an angle (α) of approximately 15° to the direction of flow.

Langmuir[3] studied the stream double refraction of several sols flowing downward within a pipette (8 mm inside diameter). He stated that "the presence of a dark central band is characteristic of particles which are disks or flat plates. Rods become oriented in the direction of flow which is also the direction of shear, and so give transmission over the whole width of the tube. Disks or plates in a non-crystalline liquid should become oriented with their planes parallel to the tube axis, but perpendicular to the radius of the cylinder through the particle, for these planes are tangent to the surface of shear. If the particles are circular disks, they should not change the plane of polarization of light passing through the axis of the tube and thus there should be a black band in the axis when the crossed polaroids are at 45°. If, however, the particles are plates which are longer than they are broad, so that their long axes are oriented parallel to the tube axis, the intensity of the central band should serve as a measure of the ratio of width to length." He observed a tilting of plate-shaped bentonite particles relative to the direction of flow in the edges of the stream within the pipette. Langmuir explained the tilting by assuming that the bentonite particles are oriented in a cubic lattice. When subjected to shear caused by flow he assumed that the position of the particles is changed from the cubic arrangement to a parallelogram arrangement and that the repulsive forces between the particles are modified as a result of the changed arrangement, causing the tilting of the forward ends of the particles toward the center of the stream.

Bernal and Fankuchen[4] were unable, by means of x-ray diffraction methods, to detect any evidence of spacings corresponding to the length of tobacco mosaic virus particles. They therefore assumed from their evidence that the particles in the "virus crystals" are oriented in 2 dimensions but not in the third dimension. Langmuir accepted this interpretation and stated that in very old V_2O_5 sols, "as in tobacco virus solutions, there is probably no regularity of micelle arrangement in directions parallel to their length, so that the forces . . . which cause the tilting are absent. In new V_2O_5 sols, however, the shorter particles permit a three-dimensional rather than a two-dimensional lattice arrangement and so give $\alpha \neq 0$."

We have studied tobacco mosaic virus by means of Langmuir's pipette technique and, as in the stream expelled from the small tube, find a lower birefringence in a narrow central band in the center of the stream than in adjacent regions on each side. Again we also find the tilting of the particles relative to the direction of flow in the most birefringent portions on each side of the central band. This evidence will be given in detail in a later publication.

We would suggest that the unexpected low birefringence observed in the middle of the stream of rod-shaped tobacco mosaic particles is probably due to the particles in the portion of the stream nearest the observer having their forward end tilted away from the observer and those in the portion opposite the observer having their forward end tilted toward the observer. Particles in such positions should produce lower form birefringence than if oriented in a direction parallel to flow.

If Langmuir is correct in assuming that the tilting of particles in a stream is dependent on a 3-dimensional lattice arrangement of the particles the obvious conclusion from our results would be that there is a 3-dimensional orientation of tobacco mosaic particles.

Recent results with the electron microscope[5,6,7] indicate considerable variation in the length of tobacco

[3] *Jour. Chem. Phys.*, 6: 873, 1938.

[4] *Nature*, 139: 923, 1937.

mosaic particles. Approximately 70 to 80 per cent. of the particles have a length close to 3,000 Å; most of the remainder have a length between 750 and 2,250 Å. It is evident from these results that, if there is orientation in the third dimension, the characteristic spacing could be as great as 3,000 Å, a value too great to have been detected by the x-ray technique used by Bernal and Fankuchen.[8] Their x-ray results therefore can no longer be considered evidence against a 3-dimensional orientation of the particles. If there is orientation in the third dimension it would probably be much less perfect than in most crystals because of the variation in the length of the virus particles.

From the above discussion it is evident that our suggestion of a 3-dimensional orientation of tobacco mosaic particles is based on Langmuir's evidence that tilting of particles is dependent on a 3-dimensional arrangement. If the tilting is not dependent on a 3-dimensional arrangement but on other factors mentioned by various workers,[9] assumption of a 3-dimensional orientation of tobacco mosaic virus particles would be unfounded.

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THE INCOMPLETENESS OF SOME ECOLOGICAL GRASSLAND STUDIES

As an ecological factor in pastures, the wild animal life, consisting mostly of small inconspicuous invertebrates, must at least be considered, even if it is thought not to equal in its effect the feeding of domestic animals, the competition of weeds or the vigor of the different species of the grasses themselves, and the physical environmental factors of topography, soil and climate. The neglect of this factor of the smaller wild animals may lead to serious errors. For, incredible as it may seem, in many a pasture grazed not too close to its carrying capacity, the obvious cows and horses are not as great a bulk as the total weight of insect and other wild animal life existing there. Ants and leafhoppers are especially numerous in grasslands, but because of their small size, the effect of their presence is not so marked as that of grasshoppers, cutworms and white grubs, which eat almost as much of the pasturage as do the domestic animals.[1]

[5] W. M. Stanley and Thomas F. Anderson, *Jour. Biol. Chem.*, 139: 325, 1941.
[6] T. E. Rawlins, Science, 96: 425, 1942.
[7] T. E. Rawlins and Nedra M. Utech. Unpublished results.
[8] J. D. Bernal and I. Fankuchen, *Jour. Gen. Physiol.*, 25: 111, 1941.
[9] J. T. Edsall, *Advances in Colloid Science*, 1: 269, 1942.

The statistical studies conducted on grasslands in England and of a considerable variety of environments elsewhere[2] have, unfortunately, not been carried far enough to show how much each species of insect, spider, millipede, snail, earthworm and nematode adds or subtracts from the vegetation of the area, and what is the total effect of their combined impact. In the numerous studies of grasslands now being conducted because of the value of such areas in soil conservation, no more fruitful project is open, and the failure to include such records of the wild animal life of pastures and meadows is sure to result in a seriously distorted picture.

"An Ecological and Grazing Capacity Study of the Native Grass Pastures in Southern Alberta, Saskatchewan and Manitoba"[3] mentions not a single insect, yet it is preposterous to suppose that no grasshopper disputed with the domestic live stock as to which should eat the grass of these Canadian pastures. "Pastures of Puerto Rico and Their Relation to Soil Conservation"[4] also says not a word of the insects that feed on the pasture grasses of Puerto Rico. Admittedly, however, it does not leave out all mention of insects, for concerning the weed "botoncillo" it states: "It is host plant for the beneficial wasp *Larra americana*, which is a parasite on changas or mole crickets." Reassuring as it may seem to have one's pet parasite introduction project[5] thus signalized for mention, it raises the disturbing suspicion that this may be only the doubtful reward of undue propaganda.

Dr. Herbert Osborn has written an entire book about "Meadow and Pasture Insects" of North America. In the tropics, as elsewhere, the effect of insect life in grasslands may be conspicuous, and is especially obvious when an attempt is made to replace native grasses. The Agricultural Experiment Station at Mayaguez has reported[6] the susceptibility of Java grass, *Polytrias amaura*, to the attack of the chinch bug, but nevertheless it was planted at one of the naval bases in a region of Puerto Rico where chinch bugs are notably scarce on all native grasses. Despite a rainfall normally excessive for chinch bugs, the favorable factor of a very susceptible grass enabled them to become so abundant as to kill the grass in large patches, and render the entire lawn so yellow as to contrast unfavorably with the standardized dirty green camouflage of the buildings. At an army post in

[1] *Ecological Monographs*, 7 (1): 1–90, January, 1937.
[2] See Bibliography, *Bull. Chicago Acad. Sci.*, 6 (4): 63–124, August, 1941.
[3] Tech. Bull. No. 44, Dominion Experiment Station, Swift Current, Saskatchewan, September, 1942.
[4] Misc. Pub. No. 513, U. S. Department of Agriculture, May, 1943.
[5] *Jour. Econ. Ent.*, 34 (1): 53–6, April, 1941.
[6] Report Puerto Rico Agricultural Station, 1936.

Puerto Rico, the planted Bermuda grass was being eaten by changas, *Scapteriscus vicinus* Scudder, although just outside the post, the native gramma grass, *Stenotaphrum secundatum,* flourished with undiminished vigor.

It should not be thought, however, that gramma grass, or any other native grass for that matter, will survive insect attacks under all conditions. Indeed, when supposedly ideal conditions are being artificially supplied for the grass, these may be even more favorable for some particular insect pest. Thus, a circle of yellow gramma grass surrounding the head of an underground sprinkler system was found to mark the limits of an exceptional abundance of a leafhopper, *Kolla fasciata* Walker, present in only normal numbers elsewhere on a lawn near Aguadilla, Puerto Rico.[7] Naturally, also, native vegetation has specific native pests, and large areas of gramma grass may have all the blades eaten down to the sprawling stalks by the little green Pyralid caterpillars of *Psara phaeopteralis* Guenée. These are only a few of the more obvious examples of the effect produced by specific members of the wild animal life of grasslands, but are ample to illustrate the necessity for including them in all ecological studies of pastures and meadows if these are to be considered at all complete.

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[7] *Jour. Econ. Ent.*, 33 (3): 584, February, 1940.

PROPER CREDIT FOR DISCOVERY OF "A RELATIONSHIP BETWEEN DENTAL CARIES AND SALIVA"

IN the March 31, 1944, issue of SCIENCE, Turner and Crane[1] report that they have discovered "a clear relationship . . . between the rate of starch hydrolysis by saliva and the incidence of caries in the individual." The note gives the impression that the finding is new, as indicated by the part quoted here and the absence of any reference to other work on this subject. Therefore, attention should be called to the fact that in 1941 Florestano, Faber and James,[2] using a much larger number of subjects, discovered and reported essentially the same results and conclusions. Consequently, credit for the finding should go to the latter group of workers.

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[1] N. C. Turner and E. M. Crane, SCIENCE, 99: 262, 1944.
[2] H. J. Florestano, J. E. Faber and L. H. James, *Jour. Am. Dental Assoc.*, 28: 1799–1803, 1941.

SCIENTIFIC BOOKS

PLANT VIRUSES

Plant Viruses and Virus Diseases. By F. C. BAWDEN. Second edition. xi + 294 pp. Waltham, Mass., Chronica Botanica Company. 1943. $4.75.

THE book represents an attempt to describe and correlate advances that have been made in the study of plant viruses during the last decade. It deals largely with less than a dozen viruses whose chemical and physical properties have been studied somewhat intensively. Such emphasis on the chemical and physical phases of virus work is perhaps justified, since it is in this field that plant virus research has made remarkable advances in recent years, but I suspect that most plant pathologists would prefer a book discussing virus diseases more broadly. On the whole the book is unusually well written and well illustrated. Biochemical and biophysical phases of plant virus research, especially, are presented accurately and entertainingly, although some descriptions of chemical methods seem unnecessarily long and detailed.

It is unfortunate that in a book of such excellence there should be some serious errors. Chapter 5, which the author states needed extensive alterations in the preparation of a second edition because of the growth of knowledge regarding the relationships between viruses and their insect vectors, may be cited in this connection. In discussing the latent period of viruses in insect vectors the author states on page 76 that the latent period "seems to start from the time the vectors leave the infected plant rather than from the start of feeding on it." The reviewer knows of no evidence anywhere in plant virus literature to support this statement. In discussing such viruses as aster yellows, whose vectors have prolonged latent periods, he states that "in published work there is no indication that vectors can ever infect healthy plants immediately after leaving infected ones." As a matter of fact such cases are reported in the literature. In discussing Black's evidence that the virus of aster yellows multiplies in the vector *Cicadula sexnotata* on page 80 he states, "it is noticeable that the number of successful inoculations is usually greater if the extracts of macerated insects are diluted 1/1000 than if diluted 1/100 or 1/10." This statement is misleading because Black's data do not indicate that dilutions at 1/1000 give more transmissions than dilutions at 1/100 or 1/10. Perhaps the most unsatisfactory section in the chapter is that dealing with work by Fukushi. The author cites the same two papers, published in 1934 and 1935, that were referred to in the first edition and makes essentially the same arguments against Fukushi's evidence that rice stunt virus multiplies in the vector. In papers published in 1939 and

1940 Fukushi has brought evidence for multiplication in the vector which the reviewer considers overwhelming. The 1939 paper at least must have reached England, for it is abstracted in the *Review of Applied Mycology*. In any case, the discussion relating to multiplication of viruses in insects is unsatisfactory. Carelessness in citing literature is not confined to references regarding the researches of others but extends to some references made to Bawden's own papers. On page 162, for example, he quotes two papers by Bawden and Pirie, published in 1936 and 1937. The 1936 paper cited is not pertinent to the subject under discussion. Another paper by Bawden and Pirie published in 1936, which should have been cited, is not mentioned. The 1937 paper is incorrectly cited.

Chapter 1 gives a brief account of the history of plant virus research. Chapters 2 and 3 describe symptoms associated with representative virus diseases on different hosts and under different conditions. Chapter 4 discusses transmission by various methods. A rather complete list of the viruses known to be spread by insects is given. A statement on page 60 that sugar-cane mosaic is transmitted by aphids and by a leafhopper is in error. Sugar-cane mosaic is not known to be transmitted by any leafhopper.

Chapter 6 on virus strains, mutations and acquired immunity is one of the best. The new conception that most viruses exist in a number of strains has done much to clarify virus disease problems; this the author brings out forcibly. He discusses two types of behavior in virus-infected plants that have been described under the term "acquired immunity." The first type covers cases in which a disease is severe in the acute stage but mild in the chronic stage. The second covers cases in which plants affected by one strain of a virus become immune from infection by other strains of the same virus.

Serological reactions of the plant viruses are dealt with in Chapter 7, where the author shows how precipitin reactions, complement fixation, neutralization of infectivity and anaphylaxis reactions may be used in identifying viruses and in showing relationships between them as well as in quantitative measurements.

Chapters 8, 9, 10, 11 and 12 cover methods of purifying viruses, properties of purified virus preparations, optical properties of purified virus preparations, inactivation of viruses and sizes of virus particles. Chapter 13, on the physiology of virus-diseased plants, enumerates most of the chemical changes known to take place in affected plants. It is the reviewer's opinion that the book would have been improved if in these chapters more emphasis had been placed on the numerous experiments performed by Stanley and his associates in proving that the so-called virus protein isolated from plants affected by tobacco mosaic had the properties of tobacco mosaic virus, since it was this work that initiated a new era in virus research. In chapter 13, also, the movement and multiplication of viruses in different tissues are discussed.

Chapter 14 is on the naming and classification of viruses, and chapter 15 on control of virus diseases. In the last chapter, chapter 16, various views as to whether or not viruses are living and theories of their origin and mode of increase are presented.

The author has undoubtedly succeeded in describing and correlating recent advances in the study of plant viruses in the second edition in a more thoroughgoing way than in the first. It seems safe to predict that this edition will be received with the same enthusiasm that was accorded the first.

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ANOPHELES GAMBIAE

Anopheles gambiae in Brazil, 1930 to 1940. By FRED L. SOPER and D. BRUCE WILSON, 262 pp., 75 figs. New York: The Rockefeller Foundation.

WHEN we fight a common enemy we expect to share with our allies the burden of the cost of the war. If the fighting takes place in foreign lands, it is to our advantage, but by no means does that lessen our obligations. Brazil, with the aid of the Rockefeller Foundation, recently fought, and won, a war for most of the countries in the New World. The enemy was not a political one, but nevertheless is capable of great destruction of life and property, for it is one of the deadliest disease carriers known—*Anopheles gambiae.*

Anopheles gambiae is native to tropical Africa. Late in 1929 or early in 1930 it was carried across the South Atlantic to Natal, Brazil, probably by one of the fast mail-carrying French destroyers which were capable of traveling between Dakar and Natal in only four days. In the following years it spread along the coast northward from Natal to Caponga, a fishing village only forty-five kilometers from Fortaleza, and from the coast it advanced inland along the river valleys until, by 1940, it had invaded the upper reaches of the Jaguaribe and its tributaries as far as Madelena, Barra de Conceição and Quixará. Its range also included the valley of the Assú River as far as São Rafael, and the Apodí valley as far as São Sebastião and Augusto Severo. The migration was accomplished by infiltration, that is, by short flights from one breeding place to another and by transportation of the adult in various kinds of vehicles.

Almost everywhere the *gambiae* invasion was followed by severe malaria epidemics. The first outbreak occurred at Natal in 1930 and subsided when control measures eradicated the mosquito from that city. In

1931 it raged in river valleys northwest of Natal, but the period between 1932 and 1937 is referred to as the "silent era" because, although it was extending its range, the mosquito caused no noticeable increase in malaria. The epidemic of 1938 in the Jaguaribe valley, in the state of Ceará and along the coast and rivers of the state of Rio Grande do Norte was catastrophic. It was estimated that in June and July there were 100,000 cases of malaria with over 14,000 deaths. In 1939 more than 185,000 people in the two states were given treatment for the disease.

The Brazilian Ministry of Education and Health and the Rockefeller Foundation collaborated in organizing the Malaria Service of the Northeast, with headquarters at Fortaleza. The basic unit of the control organization was the zone—an area in which one man could apply larvicides to all breeding places in one week; or an area in which all houses could be sprayed by a disinsectization squad in one week. The zone inspector was responsible to the chief inspector, whose district generally included five zones. Several districts were combined into a post, which was in charge of a doctor, and the posts were grouped into a total of seven divisions, each of which was in charge of a more experienced doctor.

The severity of the epidemic necessitated the distribution of quinine and atebrine, but the real offensive against the insect involved the painstaking search for larvae in all possible breeding places and the application of larvicides, especially Paris green, by the zone inspectors. The attack on the larva was supplemented by systematic spraying of adult mosquitoes resting in houses; although this measure can not be relied upon for eradication of the mosquito, it did increase the effectiveness of the larvicidal program and prevented many cases of malaria by killing infected adults. But the objective of the counter-attack against *A. gambiae* was not merely to control malaria; it was the complete extermination of the species in Brazil. After surveys had established the distribution of the mosquito, a cordon was thrown about the periphery of its range, and further infiltration into uninfested areas was prevented by the use of larvicides and pyrethrum spray in a belt eight to twenty-five miles beyond the known limits of the infested area, while transportation of the adult through the barrier was prevented by disinsectization of all planes, boats, trains and other vehicles. Control measures were intensified at the border, and, working from this frontier zone inward, one area after another was cleared of the invader, until in November, 1940, the last individuals of *A. gambiae* were destroyed.

This, in brief, is the account of the *gambiae* invasion of Brazil. But the authors do more than simply repeat this story. In addition to emphasizing the need for constant vigilance against such insect invaders, they challenge the old concept of malaria control that aims only at reducing the vector population below a certain level by drainage and other methods that require many years for their success, and which never completely eradicate the disease. Can *A. gambiae* be exterminated from regions within its natural home in Africa? Can *A. pseudopunctipennis* be eradicated from river valleys in Peru? It is true that *gambiae's* habit of breeding in small water collections free of vegetation, and its attraction to human habitations, not only cause it to be a more dangerous malaria carrier but also make it more susceptible to control by larvicides and spraying. Other anophelines which have a wider selection of breeding places and which rest in the jungle may be much more difficult to attack, but would it be feasible to attempt an all-out "blitzkrieg" instead of simply keeping down their numbers by control measures which must be continued forever? Extermination of such mosquitoes may not be possible, but no one thought that *A. gambiae* could be eradicated from Brazil in less than two years.

The book is well worth thoughtful perusal by all those interested in control of insects of economic and medical importance, whether they be doctors, scientists or legislators.

L. E. ROZEBOOM

SPECIAL ARTICLES

EXTRACTION OF A HIGHLY POTENT PENICILLIN INACTIVATOR FROM PENICILLIN RESISTANT STAPHYLOCOCCI[1]

BY grinding a suspension of *E. coli* in a crushing mill, Abraham and Chain[2] in 1940 produced an enzyme-like substance capable of completely inhibiting penicillin. This substance, called penicillinase, was presumably intracellular, for penicillin was not destroyed by the actively growing organisms, and no penicillin inactivator was present in culture filtrates. No penicillinase could be extracted from penicillin sensitive staphylococci, or, in later experiments,[3] from a strain of *Staph. aureus* made insensitive by repeated

[1] The penicillin was provided by the Office of Scientific Research and Development from supplies assigned by the Committee on Medical Research for experimental investigators recommended by the Committee on Chemotherapeutics and Other Agents of the National Research Council.

[2] E. P. Abraham and E. Chain, *Nature*, 146: 837, 1940.

[3] E. P. Abraham, E. Chain, C. M. Fletcher, A. D. Gardner, N. G. Heatley and M. A. Jennings, *Lancet*, 2: 177, 1941.

subcultures in the presence of penicillin. Harper[4] has recently prepared acetone-ether extracts of paracolon bacilli which were more effective penicillin inhibitors than were extracts of *E. coli*.

The purpose of this report is to describe the extraction of a highly potent penicillin inactivator from 7 strains of *Staph. aureus* (coagulase positive). Details of the strains will be presented elsewhere. Briefly, they were "naturally" penicillin resistant; all were isolated from patients who had not received penicillin. The method of extraction was that used by Harper.[3] Saline suspensions of 24-hour plate cultures were precipitated with 7 volumes of acetone. After a change of acetone, and two of ether, the precipitate was dried quickly *in vacuo* and stored at room temperature. For tests of potency, broth suspensions of the powder were added to broth cultures containing a constant inoculum of hemolytic streptococci (about 1 million organisms per cc) and varying amounts of penicillin. A typical experiment is presented in Table I.

TABLE I

PROTOCOL OF A TYPICAL EXPERIMENT SHOWING RAPID, COMPLETE DESTRUCTION OF 100 UNITS OF PENICILLIN BY 1 MGM OF THE POWDERED EXTRACT OF A PENICILLIN RESISTANT STRAIN OF STAPH. AUREUS. TURBIDITIES ARE EXPRESSED IN TERMS OF OPTICAL DENSITY

Tube	Broth plus hemolytic streptococcus	Penicillin	Penicillinase 1 mgm/cc	Sterile broth
1	10 cc	0	0	0
2	9 "	1 cc (1 μ/cc)	0	0
3	8 "	1 cc (100 μ/cc)	1 cc	0
4	0 "	0	1 cc	9 cc

RESULTS

Tube	Initial	4 hours	8 hours	12 hours
1	.07	.29	1.0	1.0
2	.04	.06	.06	.06
3	.14	.17	.30	1.0
4	.18	.18	.19	.18

Optical densities (turbidities) were measured with a Coleman universal spectrophotometer every few hours while the solutions were incubated at 37° C. As indicated in the table, complete destruction of 100 units of penicillin by 1 mgm of the powder was so rapid that at the end of 12 hours growth in this tube was equal to that of the control. Although there were some variations, this same high degree of potency was shown by the extracts of all 7 strains.

Extracts of 7 penicillin sensitive strains of *Staph. aureus* (coagulase positive) were tested in the same manner, using 2 mgms of the powder and only 1 unit of penicillin. In no instance was there any inactivation of penicillin.

Actively growing cultures of the resistant strains caused complete destruction of penicillin in the culture fluid, but the seitz filtrate of the fluid contained no penicillin inactivator. Ability to destroy penicillin was completely lost when a broth suspension of the powder was left at 56° C for 1 hour. Further studies of the properties of this substance are in progress; it is not possible at present to say whether it is the same thing as the extracts of the colon and paracolon bacilli.

The powdered extracts are now being used routinely in this clinic for all cultures of patients who are receiving penicillin.

SUMMARY

A highly potent penicillin inactivator has been extracted from 7 strains of *Staph. aureus* (coagulase positive), all of which were naturally penicillin resistant. No such inhibitor was present in extracts of 7 penicillin sensitive strains of *Staph. aureus*.

Acknowledgment: I am indebted to Miss Mary Beach for technical assistance.

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[4] G. J. Harper, *Lancet*, 2: 569, 1943.

ENHANCEMENT OF THE IMMUNIZING CAPACITY OF INFLUENZA VIRUS VACCINES WITH ADJUVANTS[1]

FREUND and McDermott[2] reported that an intense, prolonged sensitization to horse serum and increased production of antibody occurred when the serum was combined with a lanolin-like substance and killed tubercle bacilli suspended in paraffin oil. The present report describes the effect of various adjuvants on the antibody production and immunizing capacity of a single subcutaneous inoculation of formalinized influenza virus in animals.

Allantoic fluid suspensions of PR8 virus, which had been rendered non-infectious by the addition of 0.1 per cent. formaldehyde, were blended with paraffin oil containing dead tubercle bacilli[3] and an absorption base known as Falba.[4] Each cc of the emulsion contained 0.4 cc of the allantoic fluid, 0.4 cc of paraffin oil, 0.2 cc of Falba and 1.4 mg of dried, heat-killed tubercle bacilli. The immunizing capacity of a subcutaneous inoculation of 0.5 cc of the emulsion was tested in young adult Swiss mice. For controls a comparable group of mice received the same amount of virus suspended in saline, and a third group received only saline. Mice from each of the three groups were tested for resistance to intranasal instillation of graded amounts of PR8 virus at various

[1] From the Laboratories of the International Health Division, The Rockefeller Foundation, New York.

[2] J. Freund and K. McDermott, *Proc. Soc. Exp. Biol. and Med.*, 49: 548, 1942.

[3] The tubercle bacilli, which were the virulent human Jamaica No. 22 strain, were kindly supplied by Dr. M. W. Chase. They were heated at 100° C in the Arnold sterilizer for 30 minutes and after being dried were incorporated in sterile paraffin oil.

[4] Distributed by Pflatz and Bauer, Inc., New York.

times after vaccination. The mice that received the virus in saline were resistant to about 100 MLD of virus at 4 and 8 weeks after vaccination, but after 26 weeks no immunity could be detected. The mice that received the virus plus adjuvants, on the other hand, were resistant to about 1,000,000 MLD of virus at 4 and 8 weeks after vaccination and even after 26 weeks they were resistant to at least 1,000 MLD.

The antibody response in ferrets following intranasal instillation of active PR8 virus was compared with the amount of antibody elicited by a single subcutaneous inoculation (2 cc) of formalinized PR8 virus with and without the above-mentioned adjuvants. The results are shown in Table 1. The antibody titers elicited in rabbits by allantoic fluid suspensions of influenza virus and by concentrated preparations of the virus[5] were likewise increased and maintained at high levels by these adjuvants. The experiments indicated clearly that the adjuvants provide a much more effective method of increasing antibody production to the virus than the use of concentrated preparations of virus alone.

TABLE 1

SERUM ANTIBODY TITERS IN FERRETS FOLLOWING SUBCUTANEOUS INOCULATION OF FORMALINIZED INFLUENZA VIRUS WITH AND WITHOUT ADJUVANTS AND FOLLOWING INTRANASAL INSTILLATION OF ACTIVE VIRUS

Test bleeding weeks	Mean serum antibody titer* of ferrets inoculated with		
	Formalized virus subtaneously		Active virus intranasally
	+ saline	+ adjuvants	
0	< 32	< 32	< 32
2	388	3,010	10,800
4	169	10,100	3,580
6	147	7,650	2,306
10	128	3,010	1,670
14	104	2,200	1,350
18	91	2,520	1,270

* The titers were determined by means of a standard red cell agglutination inhibition test (G. K. Hirst and E. G. Pickels, *Jour. Immunol.*, 45: 273, 1942), and are expressed as the reciprocal of the serum dilution end point. Four ferrets were used for each group.

Further experiments have shown that another acid-fast organism, *Mycobacterium butyricum,* could be substituted for the tubercle bacilli in the emulsions with the same degree of enhancement of immunity against the virus as described above. The acid-fast bacteria were essential in the vaccines, for paraffin oil and Falba alone were less effective. Aleuronat, broth and plain diphtheria toxoid had no detectable effect on the antigenicity of the virus. When influenza virus was sedimented from allantoic fluid by high-speed centrifugation and resuspended in sesame oil together with dried, heat-killed *M. butyricum,* it elicited antibody titers in rabbits which were about 4 times higher than when the sedimented virus was resuspended in saline.

The results make plain that the addition of certain adjuvants to influenza virus vaccines not only greatly increases the immunizing capacity of the virus in experimental animals but maintains the immunity at a high level over a long period. It seems unlikely that the adjuvants employed in the above experiments can be safely used in human beings. Further study of the phenomenon, however, may provide materials which can be utilized in human vaccination. A more complete report will be published at a later date.

WILLIAM F. FRIEDEWALD

[5] G. K. Hirst, *Jour. Exp. Med.*, 76: 195, 1942; T. Francis, Jr. and J. E. Salk, SCIENCE, 96: 499, 1942.

ASCORBIC ACID LOSSES IN MINCING FRESH VEGETABLES[1]

DURING a period of shortage of fresh vegetables, the importance of conserving vitamins is evident. In the preparation of many salads, raw vegetables and fruits are finely minced. In many mess halls vegetables are minced in a machine called the "Buffalo chopper." This machine is merely a bowl set under a pair of rotating blades. These function like the old-fashioned wooden bowl used with a hand chopper for mincing cabbage.

Numerous studies have indicated that maceration speeds the rate of disappearance of ascorbic acid in fresh plant products.[2, 3] Enzymes, metallic catalysts and fine division favor oxidation.

A series of studies to learn methods of conserving vitamin C have been completed in the naval hospital cafeteria of the National Naval Medical Center. Spe-

TABLE 1

ASCORBIC ACID LOSSES FROM CUTTING FRESH VEGETABLES (MG/100 GM)

Vegetable	Cutting tool	Freshly cut	30 mins. after cutting	2 hrs. after cutting
Green peppers	Plastic knife	130	128	87
	Steel knife		118	53
	"Chopper"		84	31
Radish	Plastic knife	52	49	35
	Steel knife		41	8
	"Chopper"		36	5
Cabbage	Plastic knife	27	26	19
	Steel knife		8	8
	"Chopper"		7	6
Cucumbers	Plastic knife	14	12	7
	Steel knife		10	5
	"Chopper"		3	2
Onions	Plastic knife	11	10	8
	"Chopper"		2	2
Lettuce	Plastic knife	4	2	1
	Steel knife		1	1
Tomatoes	Plastic knife	13	9	9
	Steel knife		8	8

[1] The opinions and views set forth in this article are those of the writers and are not to be considered as reflecting the policies of the Navy Department.

[2] C. G. King, "Physiology of Vitamin C. The Vitamins." Amer, Med. Assn., Chicago, p. 331, 1939.

[3] M. Pyke, *Nature*, 149: 499, 1942.

cial attention has been given to the knives used for mincing vegetables, since their composition may be important. Furthermore, in large-scale cookery salads are often prepared one or more hours before they are served. Therefore, attention was given to the rate of disappearance of ascorbic acid. All analyses were run by the method of Bessey.[4]

The procedure followed was to remove the vegetables from cold storage. A liberal sample was set aside without cutting. Another sample was thinly sliced with a plastic knife. A third was sliced with a steel knife. A fourth was put through the Buffalo grinder. The samples were then taken to the laboratory. The original time of cutting was recorded.

At the laboratory samples of the intact vegetable were prepared for immediate analysis by mincing on a wooden board with a plastic knife. The other samples were run one half hour and two hours after the initial slicing.

Typical data are shown in Table 1. These data indicate the losses that result from both the knives used in cutting and from the time of standing of the cut vegetable. Possibly some form of plastic bowl and knife can be devised for the "Buffalo chopper." Wherever possible salads should be prepared with large pieces of fruits or vegetables prepared just before serving.

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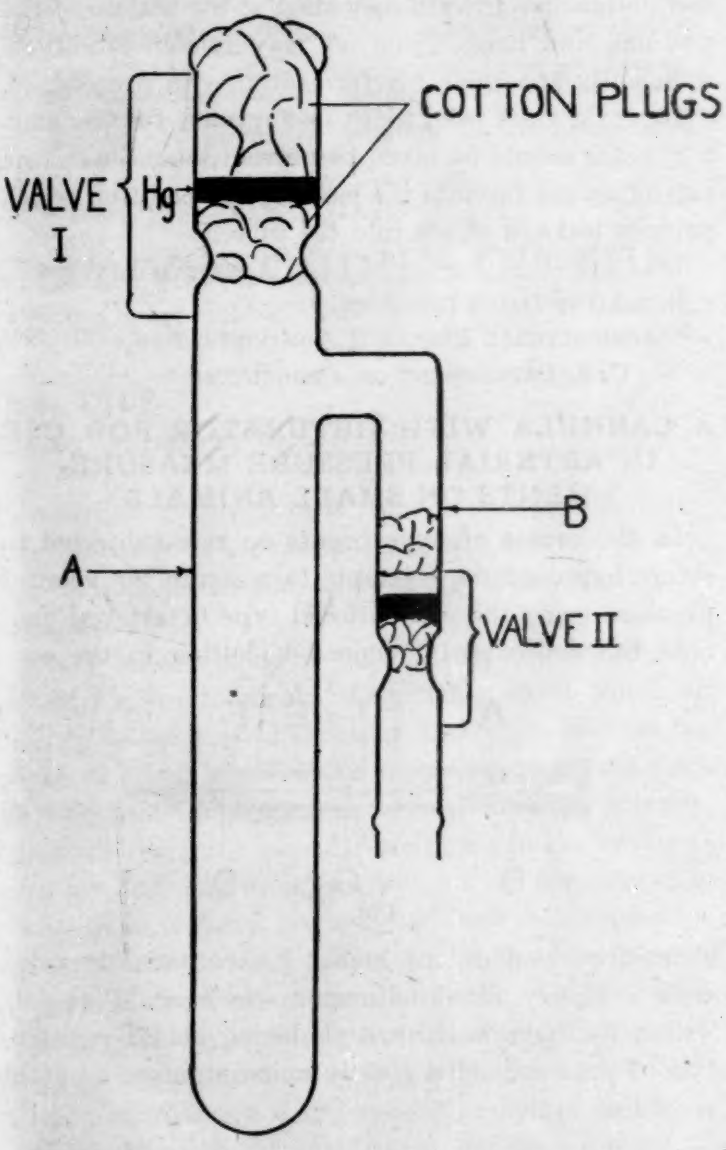
SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLIFIED LABORATORY CHECK VALVE AND ITS APPLICATION IN THE CONSTRUCTION OF ANAEROBIC CULTURE TUBES

Sintered glass filters have been used as one-way or check-valves in a variety of ways.[1] However, besides being difficult to construct, these are relatively expensive. An inexpensive substitute may readily be realized in any laboratory simply by floating mercury over a cotton or glass wool plug contained in the constricted portion of a tube. This valve will not permit the passage of air into the tube, but will relieve the slightest pressure of gas within.

In certain applications a check valve of the type described above possesses an advantage over the sintered glass type. This is particularly true of its application in the construction of bacteriological tubes for the growth of anaerobes. Fig. 1 shows a tube constructed in this laboratory for the cultivation of *Clostridium acetobutylicum*. *A* is a 22 × 175 mm test tube to which tube *B* (approximately 10 mm diameter) is sealed as a side arm. Tube *A* contains a constriction in which a cotton or glass wool plug fits snugly. Mercury is floated over this plug to a depth of at least ¼"; and above this mercury a cotton plug is inserted to prevent splattering. A sheet of paper fastened over the open end may be used to accomplish the same purpose. Tube *B* is bent at right angles. Below the bend a check valve is assembled in the same manner as indicated above. The use of the tube is illustrated in what follows.

Medium is introduced into tube A, and the tube and its contents are sterilized with the cotton plugs of valve I, and the plugs and mercury of valve II in place. Following sterilization and cooling, the in-



[4] O. A. Bessey, *Jour. Biol. Chem.*, 126: 771, 1938.

[1] A. A. Morton, "Laboratory Technique, Organic Chemistry," McGraw-Hill. 1938.

oculum is introduced aseptically into *A*, the lower cotton plug is re-inserted and covered with a layer of mercury, and then the upper plug is inserted. Inert gas is introduced through tube *B*, care being taken to regulate the flow so that excessive splattering is avoided. A rate of about 2 cc per minute is not excessive. The gas bubbles through check valve II and out of valve I. The tube following the displacement of air is now ready for incubation. Gases formed in *A* are vented through valve I. Following active fermentation the tube remains sealed against losses of volatile substances.

Following a run, check valve I is readily disassembled, and the tube may be cleaned and prepared for the next run. Valve II may also be disassembled to facilitate cleaning.

An advantage over sintered glass disc filters lies in the ease with which valve I is disassembled to permit the introduction of inoculum, and to permit the cleaning and re-use of a tube.

If more thorough displacement of air is desirable a tube connected to *B* by means of an inner seal and leading to the bottom of *A* may be introduced. With certain organisms, side arm *B* and valve *II* may be dispensed with. Thus with heavy inoculum of *Cl. acetobutylicum,* growth may start at the bottom of the medium, and gases given off may render conditions sufficiently anaerobic for fermentation to proceed.

In using glass wool plugs as supports for the mercury, care should be taken to prevent loose fiber from extending too far into the mercury, a condition which permits leakage of air into the tube.

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A CANNULA WITH OBTURATOR FOR USE IN ARTERIAL PRESSURE MEASUREMENTS ON SMALL ANIMALS

IN the course of experiments on rats subjected to severe hypothermia, attempts to measure the arterial pressure using the conventional type of arterial cannula failed because of repeated clotting in the constricted portion of the lumen. A cannula provided with a closely fitted obturator which could be left within the narrow tip except during actual registration of pressure aided greatly in maintaining a patent recording system.

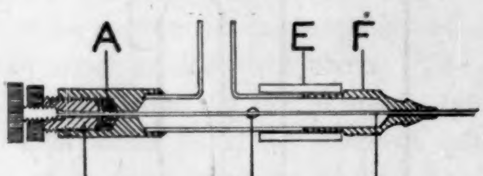

FIG. 1

The cannula was constructed from a 22 G. hypodermic needle (F), with the shaft of the needle cut to 6 mm and the flanges of the hub ground off to form a smooth cylinder. The needle tip was ground to a blunt bevel. The body of the cannula, to which the needle was joined by a short piece of rubber tubing (E), was made of a T tube of 5 mm glass tubing with each arm of the T cut to a length of 1 cm. The sliding obturator (D) was arranged in the longer axis of the cannula so that it moved within a brass gland (B) cemented to the glass T tube and filled with graphite-impregnated packing (A). The nickel-silver obturator was soldered to a threaded plug which could be screwed firmly into the gland. On the shaft of the obturator was fixed a bead of solder (C) in such a position that it would arrest the movement of the shaft when it had been withdrawn far enough to remove the tip from the lumen of the needle. With the cannula assembled, the obturator pushed completely into the needle and screwed into place, the obturator was ground to a bevel to match that of the needle.

The use of the cannula involved the usual procedure of filling the cannula and recording system with anticoagulant solution, securing the cannula within the vessel and balancing the pressure in the manometer system against the expected arterial pressure. Communication between the artery and the recording system was accomplished by withdrawing the obturator long enough for the desired measurement of pressure. In the intervals between measurements, the obturator was pushed into the lumen of the needle and left in place until the next determination. Thus any blood clot which had formed in the needle during the course of pressure recording was broken up and pushed out of the cannula.

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BOOKS RECEIVED

AINSWORTH, EDWARD G. and CHARLES E. NOYES. *Christopher Smart. A Biographical and Critical Study.* Pp. 164. University of Missouri. $1.50.

BABOR, JOSEPH A. and ALEXANDER LEHRMAN. *Selected Experiments from Laboratory Manual for Introductory College Chemistry.* Illustrated. Pp. 284. Thomas Y. Crowell Company. $1.00.

BOK, BART J. and FRANCES W. WRIGHT. *Basic Marine Navigation, and Kit of Practice Materials.* Pp. viii + 422. Houghton Mifflin Company. Book, $4.50. Kit, $1.70.

Carnegie Institution of Washington Year Book, No. 42—July 1, 1942, to June 30, 1943. Pp. xxxii + 208. Carnegie Institution of Washington, D. C.

SHIMER, HERVEY W. and ROBERT R. SHROCK. *Index Fossils of North America.* Illustrated. Pp. ix + 837. John Wiley and Sons. $20.00.

Tables of Lagrangian Interpolation Coefficients. Prepared by the Mathematical Tables Project Work Projects Administration of the Federal Works Agency. Pp. xxxvi + 383. Columbia University Press. $5.00.